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NUTRITIONAL PROBLEMS OF LARGE AND GIANT BREED DOGS. PART I. PUPPIES

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Abstract: Feeding dogs is not a simple matter. Dogs are one of the most diverse animal species in the world. Thousands of years of evolution of the species of domestic dog (*Canis lupus familiaris* L.), have resulted in the fact that nowadays there are hundreds of dog breeds that differ not only in color, type of coat or character, but above all in size. No domestic animal has had a richer history of evolution in direct human contact than the domestic dog. Due to the growing awareness of the caregivers, the pet food market is changing dynamically. Foods are produced that are adapted to the dog's age, lifestyle, physical activity and breed size. Despite this, often the animal's diet is inadequate balanced. The caregivers make the mistake of choosing a food that is not adapted to the age and size of the dog. A common problem, for example, is to give puppy food to adult dogs of small breeds, although representatives of these breeds reach maturity more quickly than large breed dogs. Furthermore, the current nutritional guidelines do not provide recommended minimum and maximum amounts of any given nutrient based on the breed size of the dog. The purpose of this article is to characterize the most important nutrients, especially important in the nutrition of large and giant breed puppies.

Keywords: domestic dog, large and giant breeds, puppies, nutrition.

THE ESSENCE OF NUTRITION

No domestic animal has had a richer history of evolution in direct human contact than the domestic dog, which has lived alongside humans for over ten thousand years since the domestication of its ancestor – grey wolf (*Canis lupus familiaris* L.) (Pendleton et al. 2018). The domestic dog is a semi-carnivore. Its tooth pattern is characteristic of carnivores. An adult dog has 42 teeth and a puppy has 28 milk teeth (14 in the maxilla and 14 in the lower jaw). Premolars are temporary and permanent. The exception is the first premolar tooth which is a permanent tooth in a dog (Przespolewska and Kobryń 2011).

A balanced diet during the puppy period is a key factor in the proper development of the body in many respects. At this stage of life, extremely intense growth and development takes place over a relatively short period of time. The feeding method is influenced by the breed predisposition, as dogs have different nutritional needs depending on the breed size. The growth

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phase is shorter in small breeds – the transition from puppy food to adult food should take place at 10–12 months of age. In puppies of large breeds, the growth phase is extended, therefore puppy food should be given to them until 15–18 months of age, and in giant breed dogs – up to 24 months of age (Hołda and Głogowski 2016; Villarreal et al. 2019).

The current problem is that some puppies sold in the EU are below the legal minimum age, with the risk of putting their health and well-being at risk. Proper age determination is necessary to reveal potential abuse, and is also extremely important in the context of proper nutrition of puppies. Recognized methods of determining the age of puppies include the assessment of dental age and bone age, by assessing the condition of dentition eruption and radiological appearance. However, currently available data are not detailed enough. To improve accuracy and reduce age estimation bias, more breed-specific data is needed, so more intermediate stages of development across breeds should be described (Van den Broeck and Cornillie 2020).

During the first 4–8 weeks of a dog's life, digestive and metabolic changes occur to adapt the puppy to food other than milk, making it possible to wean the offspring from the mother. Puppies acquire the ability to eat dry food at the age of 4–6 weeks. During this period, it is essential to ensure a diet that is complete in terms of energy and protein, but the most important thing is that the food is easily digestible. Boutigny et al. (2016) found that the growth rate of large breed puppies from large litters may be affected by insufficient maternal milk consumption. While there is concern about the maximum growth rate of large and giant breed puppies in the post-weaning period (2 months to adulthood) as this could lead to orthopedic problems, it is doubtful that the same would be true for the suckling phase. In fact, the maximum growth rate during the entire 3 weeks was observed in puppies that were fed exclusively by the mother (Alves 2020). Interestingly, puppies birth weight decreases with litter size (Alberghina et al. 2021). Taking the above into account, it is necessary to pay special attention to the nutrition of puppies of large and giant breed dogs, which was the purpose of this study.

MACRONUTRIENTS

Establishing general nutritional recommendations for growing dogs is difficult due to the significant differences in growth rate and target body weight between individuals of this species. The first, if not the most important nutrient necessary for the proper growth and development of a puppy is protein. The protein requirements of growing individuals are higher than that of adults because proteins are the building blocks of developing tissues during the growth process. The most valuable protein for a dog is always animal protein – the food should contain the most of it, if compared with vegetable protein. Growing dogs consume more energy as well as more food than adults, and they also consume more protein. Protein quality is determined by parameters such as the content and mutual proportions of exogenous and endogenous amino acids, as well as the digestibility of protein products. Digestibility is extremely important as the protein will not be used by the body if it is not completely digested and amino acids are not absorbed in the small intestine. The digestibility depends on the processing of the raw materials intended for animal consumption. The more it interferes with the 3-row structure of the protein, the more it reduces the digestibility coefficient, which in turn may lead to deterioration of animal health (Hewson-Hughes et al. 2011). According to Weber et al. (2017), protein digestibility is higher in individuals of large breeds. The minimum recommended level (MRL) of protein varies depending on whether the puppy is in the early or late growth stage. It is worth noting that the MRLs are not the absolute biological minimum that allows for survival, but are clearly higher than the biological minimum and allow the animal to maintain the health and well-being. For puppies under 14 weeks of age, the minimum recommended level of protein in the diet is 25 g·100 g^{-1} DM, while for older puppies is 20 g·100 g^{-1} DM (Table 1). The Euro-

pean Pet Food Industry Federation (FEDIAF 2021) nutritional guidelines do not set maximum protein limits for young dogs. On the other hand, its deficiency causes puppies to grow slower and show developmental disorders. According to studies by Nap et al. (1993) differences in protein intake significantly affect body weight, serum albumin and urea. However, differences in protein intake did not have clear implications for kidney and skeletal development. Therefore, it is believed that a causal role of protein in canine endochondral ossification disorders is unlikely (Nap et al. 1993).

Table 1. Recommended levels of protein, amino acids, fat and fatty acids (g·100 g^{-1} DM) in food for growing dogs (FEDIAF 2021)

Nutrient	Early growth (<14 weeks old)		Late growth (>14 weeks old)	
	MRL	N	MRL	N
Protein	25.00	–	20.00	–
Arginine	0.82	–	0.74	–
Histidine	0.39	–	0.25	–
Isoleucine	0.65	–	0.50	–
Leucine	1.29	–	0.80	–
Lysine	0.88	2.80	0.70	2.80
Methionine	0.35	–	0.26	–
Methionine + cysteine	0.70	–	0.53	–
Phenylalanine	0.65	–	0.50	–
Phenylalanine + tyrosine	1.30	–	1.00	–
Threonine	0.81	–	0.64	–
Tryptophan	0.23	–	0.21	–
Valine	0.68	–	0.56	–
Fat	8.50	–	8.50	–
Fatty acids				
LA C18:2	1.30	6.50	1.30	–
AA C20:4	0.03	–	0.03	–
ALA C18:3	0.08	–	0.08	–
EPA C20:5 + DHA C22:6	0.05	–	0.05	–

MRL – minimum recommended level; N – maximum recommended nutrient level.

The amino acids that make up proteins, are essential in the diet of growing puppies. Depending on whether a puppy is in the early or late growth stage, the MRL recommended by FEDIAF (2021) varies and the maximum recommended nutritional level was determined for lysine only (Table 1).

It has been shown that excess lysine in the diet (4.91 g·100 g^{-1} DM) can reduce weight gain in puppies, but 2.91 g·100 g^{-1} DM does not, and this level is the highest for puppies with no negative effect (Czarnecki et al. 1985). In the case of nutritional guidelines for growing dog and amino acids requirements, there is also no division into small and large breeds, although as is known, young representatives of these breeds have different nutritional needs.

Another exogenous amino acids in puppy nutrition are arginine, phenylalanine, histidine. The demand for arginine increases with increasing protein content due to its role as an intermediary in the urea cycle. Puppies fed a food low in arginine, but at the same time containing an adequate amount of total protein, will experience reduced food consumption and hyperammonaemia, resulting in vomiting and pilism, with increased urinary orotic acid excretion and

muscle tremors (Ha et al. 1978; Czarnecki and Baker 1984). Its deficit may cause clouding of the lens of the puppies' eye and cataracts (Ranz et al. 2002).

The nutritional requirements for phenylalanine were assessed as a function of breed size, and no difference was found. This means that the phenylalanine requirements for small breed dogs did not differ from those for large breeds (Mansilla et al. 2018). Tyrosine is a precursor of catecholamines: adrenaline and norepinephrine, and therefore plays a significant role in stress responses, but literature data focusing on dogs are scarce in this respect. A study in juvenile Labradors and Newfoundlands looked at phenylalanine and tyrosine to determine if supplementation resulted in more intense and darker coat colors. Although it was done in puppies, it likely reflected adequate eumelanin synthesis in the hair; no other physiological parameters were assessed (Watson et al. 2015).

Histidine is a structural component of proteins that plays a key role in oxygen exchange and is also a precursor to biologically active compounds such as histamine and carnosine. Limiting the amount of histidine in the diet of dogs reduces hematocrit, hemoglobin, body weight and circulating histidine, carnosine, albumin, and also reduces the levels of zinc and copper in the body. Its deficit also shows behavioral symptoms – lethargy and avoidance of meals (Cianciaruso et al. 1981).

Insufficient supply of protein and amino acids leads to a deficiency of building components and, consequently, to malnutrition of puppies, which results in inhibition of growth (Lewis 2019). Due to the high metabolic energy demand of growing dogs to prevent malnutrition, but at the same time being overweight in later age, puppies should be fed a diet calculated based on their individual energy requirements using their current body weight. A diet low in protein will cause weight lose and delay or stop growth. Because dogs of large breeds will take longer to develop, it is important that their diets do not deplete protein at the same stage as small breeds. On the other hand, increasing the protein content of a puppy's diet can cause abnormalities in skeletal development and become a potential contributor to conditions such as hip dysplasia due to increased acetabular and femoral condyle development. As a result of poorly fitting joints, this can lead to osteoarthritis and secondary osteoarthritis (Lewis 2019).

Low carbohydrate levels in the diet of small and miniature breed of young dogs may lead to hypoglycemia due to their predisposition to be unable to maintain blood glucose levels solely by gluconeogenesis (Vroom and Slappendel 1987).

Another essential nutrient is fat, which provides essential fatty acids, fat-soluble vitamins and almost 3 times more energy than protein and carbohydrates. Both fats and fatty acids are important in maintaining the health of the skin and hair, the development of the nervous system, controlling inflammation and the proper functioning of the immune system (Kirby et al. 2009). The MRLs for fat and fatty acids recommended by FEDIAF (2021) are the same whether the dog is in the early or late growth stage (Table 1). The only difference is with linoleic acid (LA), for which a maximum level is set for puppies <14 weeks of age. Among fatty acids, the most attention is paid to linoleic acid (LA), arachidonic acid (AA) from the group of n-6 acids, alpha-linoleic acid (ALA), docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) from the group of n-3 acids, which in the case of puppies, essential fatty acids are considered.

From a nutritional point of view, the AA level is important, which is only exogenous for puppies according to FEDIAF (2021) in addition to ALA, DHA and EPA, supports the nervous system, has a positive effect on immunity. The AA content of extruded dry foods may be insufficient to meet the recommended nutritional minimum (Dodd et al. 2021a).

Deficiency of DHA and EPA acids in the diet causes insufficient development of the nervous system, retina and hearing organs. In puppies, the conversion of short-chain polyunsaturated fatty acids to DHA and EPA is insufficient, therefore in dogs during the growth period it is necessary to take these fatty acids with food. Newborn puppies only have 10% of their brain weight compared

to adult dogs, and significant growth occurs in the first three months of life. DHA is a key building block of nervous tissue and is undoubtedly important in the functioning of the brain (Beynen 2017).

Long-chain polyunsaturated fatty acids, including EPA and DHA, are essential for normal nervous and retinal development in many species of mammals. The puppies in the group low in these fatty acids showed the poorest eye retinal responses compared to the high groups. The retinal reaction of puppies consuming diets containing these fatty acids occurred at lower light levels, thus showing greater sensitivity to the rods than other dietary groups. DHA and EPA improve visual performance in growing dogs (Heinemann et al. 2005).

ENERGY

Apart from fat, the source of energy are also carbohydrates. However, their amounts should not be too high, because this may lead not only to obesity at the stage of development, but also to pancreatic dysfunction in later adulthood. Feeding a diet that is too calorically dense (high in fat) can make a pup grow faster than his bones can accommodate resulting in skeletal abnormalities. The body's energy requirements depend on its metabolic mass. It is a parameter that relates to the content of tissues in the animal's body that are involved in metabolic changes. Small breeds are characterized by a much faster metabolism, therefore the energy density of food intended for representatives of small breeds should be higher than of food for large breed dogs. Nevertheless, there are exceptions. The energy demand of Newfoundland is lower than that of the average dog, while in the case of Great Danes – the energy demand is greater (Dobenecker et al. 2013).

No single formula can calculate the energy requirements for all dogs or cats (Heusner 1991) and each equation only provides a theoretical mean for a specific group of animals. Providing satisfactory nutritional recommendations therefore remains an ongoing challenge for pet food companies. In addition to lactation and imposed activity during work or sports, age may be the single most important factor in the maintenance energy requirement (MER) of most domestic dogs (Finke 1994).

Too high energy content of food may contribute to the development of obesity. Obesity and related diseases are common problems in dogs, and poor feeding during development contributes to lifelong obesity problems. Assessing the right amount of food for a growing puppy is quite a challenge and it is essential to give a simple recommendation to the caregivers. As current dietary guidelines do not take into account breed size factors, this is even more difficult. Bradley et al. (2021) analyzed how much a small breed (Norfolk Terrier puppies) required to maintain growth and a healthy body condition for the first year of life. Their findings indicated that dogs of this breed required far less than the nutritional guidelines suggested. Changes in the assessment of proper nutrition during development are therefore necessary, and nutritional guidelines should take into account the differences in nutritional needs depending on breed size. An important aspect is that small breed dogs gain weight and grow faster every day than representatives of large breeds (Schrank et al. 2020). On the other hand, puppies of large breeds have a greater growth intensity than smaller ones, i.e. in the same period they gain more weight per kg of body weight$^{0.75}$. Extrapolation from puppies of giant breeds to puppies of medium and small breeds overestimates the nutrient requirements of smaller dogs (Böswald et al. 2019).

Dogs of large and giant breeds tend to hip dysplasia, elbow dysplasia, and osteochondrosis, which lead to secondary osteoarthritis. All these skeletal diseases are favored by nutritional errors already in the period of their growth – e.g. the use of excess energy (mainly in the form of fat and carbohydrates), the development of obesity and incorrect calcium balance. An excess of nutrients leads to obesity, which has a direct impact on the formation of joints and limbs due to the increased stress on the joints. This can cause malformations in the joint, leading to conditions such as secondary osteoarthritis. Although obesity is a risk factor in all young breeds, it

may have a greater effect on larger breeds due to the overweight being transferred to growing bones over an extended period of growth (Lewis 2019).

MINERALS AND VITAMINS

In addition to basic nutrients, minerals play an important role in the nutrition of dogs. Not only their number is important, but also their mutual proportions. The FEDIAF guidelines differ slightly in the recommendations for early and late growing puppies and take into account the division into small and large breeds (Table 2).

Table 2. Macrominerals (g·100 g^{-1} DM) and trace elements (mg·100 g^{-1} DM) (FEDIAF 2021)

Nutrient	Early growth (<14 weeks old)		Late growth (>14 weeks old)	
	MRL	L/N	MRL	L/N
		Minerals		
Calcium	1.00	1.60 (N)	0.80[1]/1.00[2]	1.80 (N)
Phosphorus	0.90	–	0.70	–
Ca/P ratio	1/1	1.6/1 (N)	1/1	1.6/1[2] or 1.8/1[1] (N)
Potassium	0.44	–	0.44	–
Sodium	0.22	–	0.22	–
Chloride	0.33	–	0.33	–
Magnesium	0.04	–	0.04	–
		Trace elements		
Copper	1.10	2.80 (L)	1.10	2.80 (L)
Iodine	0.15	1.10 (L)	0.15	1.10 (L)
Iron	8.80	68.18 (L)	8.80	68.18 (L)
Manganese	0.56	17.00 (L)	0.56	17.00 (L)
Selenium	40.00	56.80 (L)	40.00	56.80 (L)
Zinc	10.00	22.70 (L)	10.00	22.70 (L)

MRL – minimum recommended level; L – legal limit; N – maximum recommended nutrient level.
[1] For puppies of dog breeds with adult body weight up to 15 kg, during the whole late growth phase (≥14 weeks).
[2] For puppies of breeds with adult body weight over 15 kg, until the age of about 6 months. Only after that time, calcium can be reduced to 0.8% DM (and the calcium-phosphorus ratio can be increased to 1.8/1)

In growing dogs, a lot of attention is paid to the prevention of skeletal disease. The structure and functioning of bone tissues in the adult life of an animal depends to a large extent on the diet in puppy age, especially in large and giant breeds. Representatives of these breeds grow quickly, but also the entire growth period lasts much longer compared to small breeds. Slower weight gain is more beneficial for the development of the skeletal system. Calcium and phosphorus are the two most important minerals for puppy's growth. Puppy caregivers, especially of large and giant breeds, pay great attention to the supply of calcium and phosphorus, as they are important in shaping the skeleton. Growing dogs need these minerals more, but the MRL is relatively low. It is recommended that food for growing dogs of large and giant breeds (Table 2) contain a minimum of 1 g of calcium per 100 g of dry matter, while for small breeds – minimum 0.8 g·100 g^{-1} of DM. Due to the fact that puppies of small and medium breeds (up to 15 kg) are less sensitive to a slight excess or deficiency of calcium, the level of this element in the diet can vary from 0.8 to 1.8% in dry weight. The problem of fast growth

concerns mainly puppies of large breeds, they have a much narrower range of optimal calcium level in the food than puppies of small and medium breeds (Table 2), similar to the Ca to P ratio – optimal in the diet is lower for puppies of large breeds than for puppies of breeds small and medium-sized. It is important because it is believed that the Ca to P ratio for puppies of large breeds should be higher than for puppies of small breeds. The ratio of Ca to P in puppies of large and giant breeds should be 1:1 to 1.6:1 (Table 2), but it should be remembered that the correct amount of calcium in the diet is much more important than its ratio to phosphorus (Wiśniewska et al. 2004; Jank 2005).

Dogs up to 10 months of age are not able to inhibit the absorption of excess calcium taken with food, which quickly leads to its accumulation in the body – this applies in particular to young dogs of large breeds. They have a narrow range for optimal food calcium levels, in contrast to young small breed dogs which have a wider range. This means that the ratio of calcium to phosphorus in the diet of young dogs of large breeds should be lower than for small breeds (Wilczak and Jank 2013).

A diet low in phosphorus causes the renal excretion of phosphorus to decrease while the renal excretion of calcium increases significantly. As a consequence, there are disturbances in appetite, growth, and the quality of the skin and hair. A diet low in phosphorus also contributes to disorders of the musculoskeletal system. According to the research by Kiefer-Hecker et al. (2017), the sharp loss of muscle strength and posture within hours led to a severe limb misalignment with joint hyperflexion but no radiographic aberrations or signs of pain. The immediate transition of sick puppies to a balanced diet with sufficient phosphorus resulted in complete recovery of the puppies in less than one month. The results show the importance of an adequate phosphorus supply for the healthy development of growing dogs (Kiefer-Hecker et al. 2017).

The joint influence of essential ingredients together with minerals and vitamins is also important. Feeding immature large breed dogs a high-calorie diet in excess of the recommendations for protein, calcium, phosphorus, and vitamin D may cause skeletal development disorders (Nap et al. 1993). The clinical consequences are most pronounced in puppies of large breeds as they are more susceptible to diseases associated with rapid growth (Lauten et al. 2002; Lauten 2006). Such diseases include orthopedic developmental diseases (DOD) (e.g., osteochondrosis dissecans, osteochondrosis, arrested cartilage core, pancreatitis, hypertrophic osteodystrophy, canine elbow dysplasia, and hip dysplasia) and dilated cardiomyopathy (Demko and McLaughlin 2005; Sanderson 2006). Many large and giant breed dogs are at risk of developmental orthopedic disease (DOD) and excess nutrients listed above are known risk factors (Schoenherr et al. 2008).

As unconventional feeding practices increase, including homemade and raw meat diets, vets must be prepared to diagnose and treat eating disorders more often. Often an improperly balanced home diet can lead to dietary deficiencies, including calcium, phosphorus, and vitamin D that are important in the development of puppies. In a study by Dodd et al. (2021b), hypovitaminosis of vitamin D and hypocalcemia were diagnosed on the basis of serum analysis, severe osteopenia was reported in the puppy. The puppy's initial bone mineralization was clearly below normal, bone mineral density was 66% lower than expected and bone mineral content was 40% lower than expected.

In another study, a 6-month-old female giant schnauzer was fed a nutritionally unbalanced home diet for a 1-month history of lameness and difficulty walking. The abnormalities identified in the supportive tests, combined with the dog's clinical improvement after changing the diet, suggested a diagnosis of vitamin D deficiency and secondary hyperparathyroidism (Tal et al. 2018). This means that caregivers' awareness of the balance of food should be increased, which is especially important in growing dogs.

The aforementioned vitamin D is primarily responsible for maintaining calcium homeostasis, regulates the hormonal balance and influences the immune response. Too low vitamin D levels are also associated with progressive kidney disease and secondary hyperparathyroidism (Parker et al. 2017). Excess dietary vitamin D can lead to hypercalcemia, causing lethargy, stiff gait, and polyuria (Mellanby et al. 2005).

With rapid development of large breed puppies, they may develop transient anemia due to iron deficiency. It can occur primarily when dietary intake does not meet the body's needs. Consequently, the iron requirements are higher in puppies due to their rapid growth (Dzanis 1994; Naigamwalla et al. 2012).

In puppies, zinc levels are also important due to the risk of zinc-responsive dermatosis, which is a rare skin disease. In dogs, it is clinically divided into two groups: syndrome I and syndrome II. Syndrome I occurs in dogs of all ages with a well-balanced diet and occurs predominantly in northern breeds (Siberian husky, Alaskan malamute, and samoyed), although isolated cases have been reported in other breeds. This is likely due to a hereditary impairment of zinc absorption or metabolism. Syndrome II develops in fast growing large breed puppies on diets low in zinc or containing excess vitamins, minerals (especially calcium), or plant phytates that can affect zinc absorption. If a positive diagnosis is made, adequate oral zinc supplementation is essential, but lifelong therapy is usually required, and dosing can be adjusted for long-term treatment (White et al. 2001; Hardy 2016).

Typically, commercial dog food for large and giant breed puppies is properly balanced in terms of the content of minerals and vitamins necessary for body development, including skeletal development. For this reason, it is not recommended to administer dietary supplements on one's own, apart from the specific recommendations of a veterinarian. Such practices can lead to too rapid skeletal development and weight gain, which threatens not only the health but also the life of dogs. At the same time, feeding poorly balanced food will have an impact on the health of the joints, causing degenerative diseases and deformations of the skeletal system, e.g. rickets.

CONCLUSION

Dogs are one of the most diverse animal species in the world. Thousands of years of evolution of domestic dog have resulted in the fact that nowadays there are hundreds of dog breeds that differ not only in color, type of coat or character, but above all in size. Often, however, the pet's diet is not properly balanced, as the caregivers make the mistake of choosing a food that is unsuitable for the age and size of the dog. Furthermore, the current nutritional guidelines do not provide recommended minimum and maximum levels of nutrient based on the breed size of the dog. In general, the diet of puppies of large and giant breed dogs should be rich in high-value protein, while at the same time containing fat rich in valuable fatty acids, especially EPA and DHA. The problem of fast growth mainly concerns puppies of large breeds, they have a much narrower range of optimal calcium level in the food than puppies of small and medium breeds, similar to the Ca to P ratio – optimal in the diet is lower for puppies of large breeds than for puppies of small and medium breeds. This is important because it is believed that the Ca to P ratio for puppies of large breeds should be higher than for puppies of small breeds. It should be remembered that the correct amount of calcium in the diet is much more important than its ratio to phosphorus. Additional administration of supplements containing vitamins and minerals is not recommended, unless the veterinarian recommends otherwise. Last but not least, food intended for puppies in large and giant breeds should be given up to 24 months of age. Growing dogs have more nutritional requirements than adult dogs. An unbalanced diet can lead to nutritional deficiencies or excesses, with harmful health consequences, especially during growth.

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PROBLEMY ŻYWIENIOWE PSÓW RAS DUŻYCH I OLBRZYMICH. CZĘŚĆ I. SZCZENIĘTA

Streszczenie: Żywienie psów nie jest prostą sprawą. Psy są jednym z najbardziej zróżnicowanych gatunków zwierząt na świecie. Tysiące lat ewolucji psa domowego (*Canis lupus familiaris* L.) sprawiły, że obecnie wyróżnia się setki ras, które różnią się nie tylko barwą i typem sierści czy charakterem, ale przede wszystkim wielkością. Żadne zwierzę domowe nie miało bogatszej historii ewolucji w bezpośrednim kontakcie z człowiekiem niż pies domowy. W związku ze wzrastającą świadomością właścicieli dynamicznie zmienia się rynek karm dla zwierząt. Produkowane są karmy dostosowane do wieku psa, jego trybu życia, aktywności fizycznej oraz wielkości rasy. Mimo to często dieta zwierzęcia nie jest prawidłowo zbilansowana. Właściciele popełniają błąd, wybierając karmę niedostosowaną do wieku i wielkości psa. Często spotykanym problemem jest na przykład podawanie dorosłym psom ras małych karmy dla szczeniąt, choć przedstawiciele tych ras osiągają dojrzałość szybciej niż psy ras dużych. Ponadto aktualne wytyczne żywieniowe nie wyróżniają zalecanych minimalnych i maksymalnych ilości danych składników pokarmowych w zależności od wielkości rasy psa. Celem tego artykułu jest scharakteryzowanie najważniejszych składników pokarmowych istotnych szczególnie w żywieniu szczeniąt psów ras dużych i olbrzymich.

Słowa kluczowe: pies domowy, rasy duże i olbrzymie, szczenięta, żywienie.